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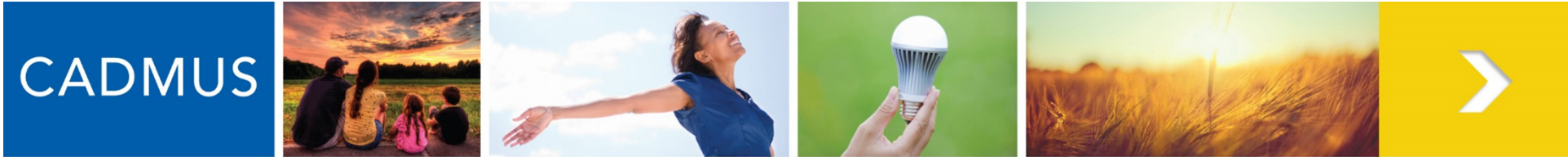


Solar PV Systems:

Inspection Techniques, Common Violations, 2014 NEC

March 9, 2017 | John Francis
at Locus Grove
Poughkeepsie NY





The Cadmus Group

- Energy Consulting Firm
 - Provides third-party de inspections for various (MA, RI, NY)
- Installers new to progra
- Random inspections
- Thorough 1 to 2-hour ir of all components
- After AHJ inspection/ap
- Rebate pending inspect

Severity of Issues (Defect Category)

Defect Category	Definition	Examples
Critical	Imminent hazard or system not operating	Modules on roof loose, busbars overloaded, Missing/inadequate OCPD
Major	Very likely to create a hazard or cause system to fail	Water collecting in enclosures, EGC/GEC undersized, breakers undersized, component not grounded
Minor	May cause a hazard/failure over time or under special circumstances	AC disconnect wired backwards, conductors touching roof surface, missing expansion joint, GEC not continuous
Incidental	Unlikely to cause a hazard/failure but not code compliant	Missing/incomplete labels, missing conduit indoor/outdoor air sealing, improper wire coloring



Cadmus Solar PV QA Inspections

- Evaluate system compliance with NEC and program technical requirements;
 - A comprehensive inspection of **all** components.
 - Random & Targeted (i.e. new installers).
 - Post AHJ Inspection.
 - Prior to receipt of grant/rebate funds.
 - Work with installers, inspectors to resolve issues by providing guidance and education.

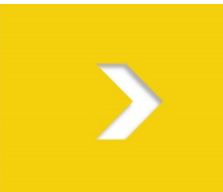




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The Good the Bad and the ugly

- Postcards from the roof the modules

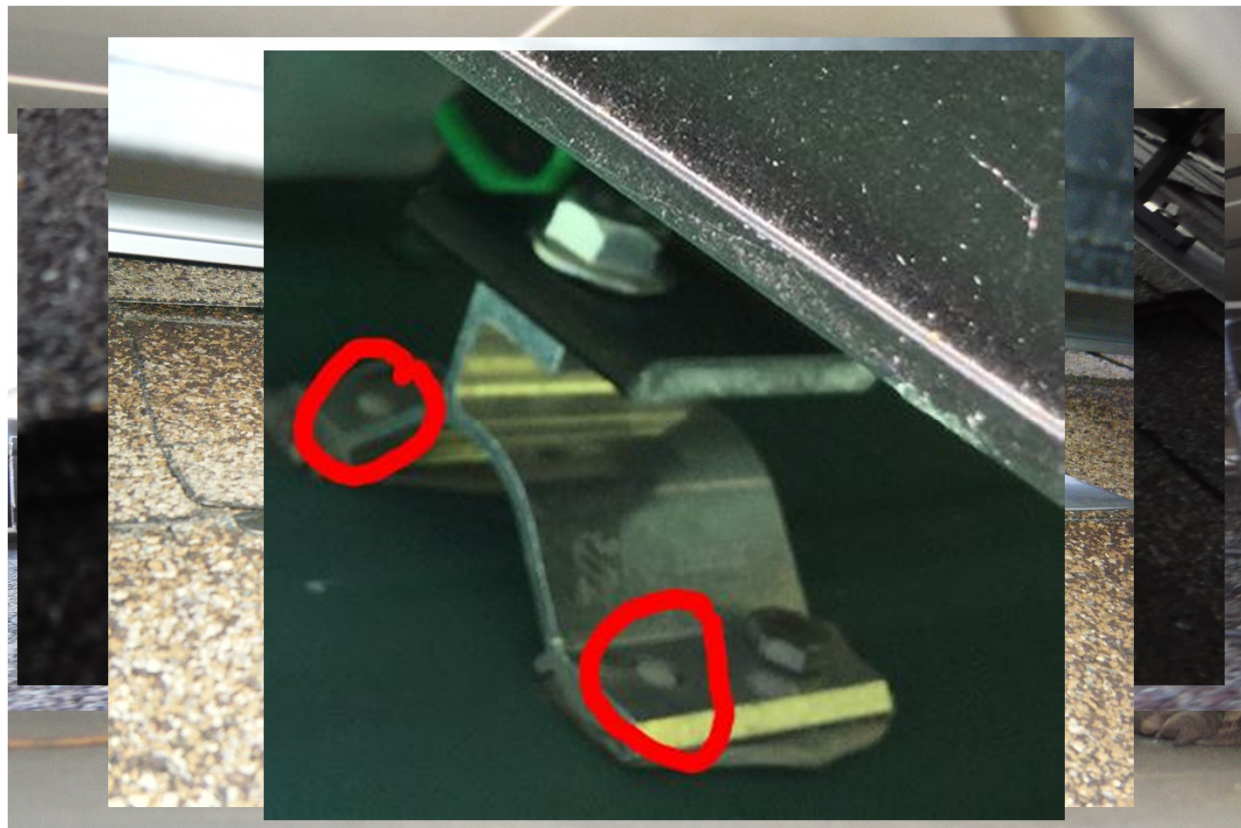




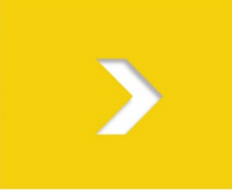
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- Postcards from under the modules

Conductors need to be secured and protected from abrasion to prevent potential ground faults. NEC 300.4 & 338.10(B)(4).



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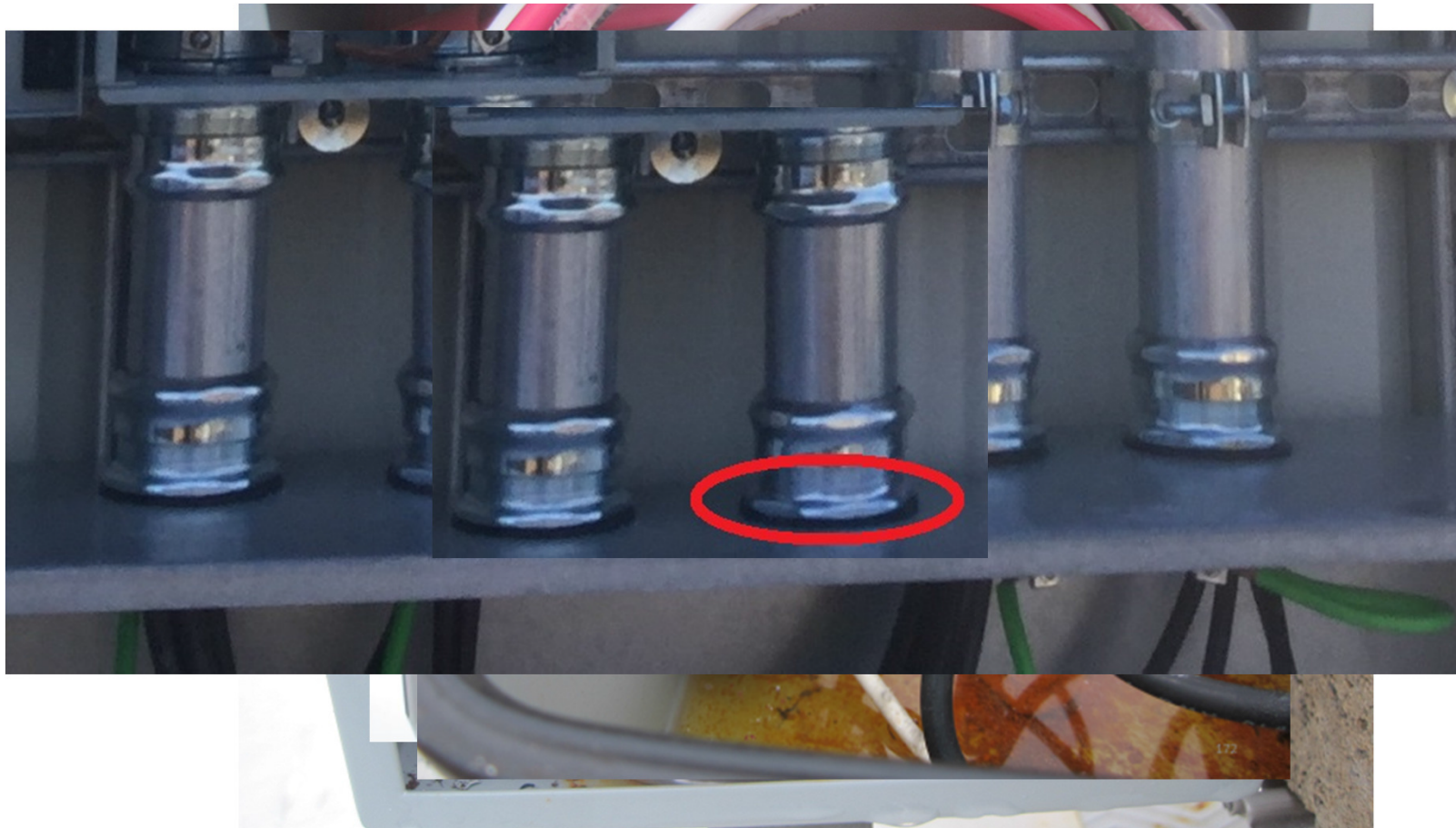
- Conjunction Function: J-boxes





Cadmus Solar PV QA Inspections

- Conjunction Function: J-boxes





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Getting off the roof: Conduit run



**Raceways shall be provided with expansion fittings where necessary to compensate for thermal expansion and contraction. NEC 300.7(B) FPN: Table 352.44
PVC NEC Article 352.44**



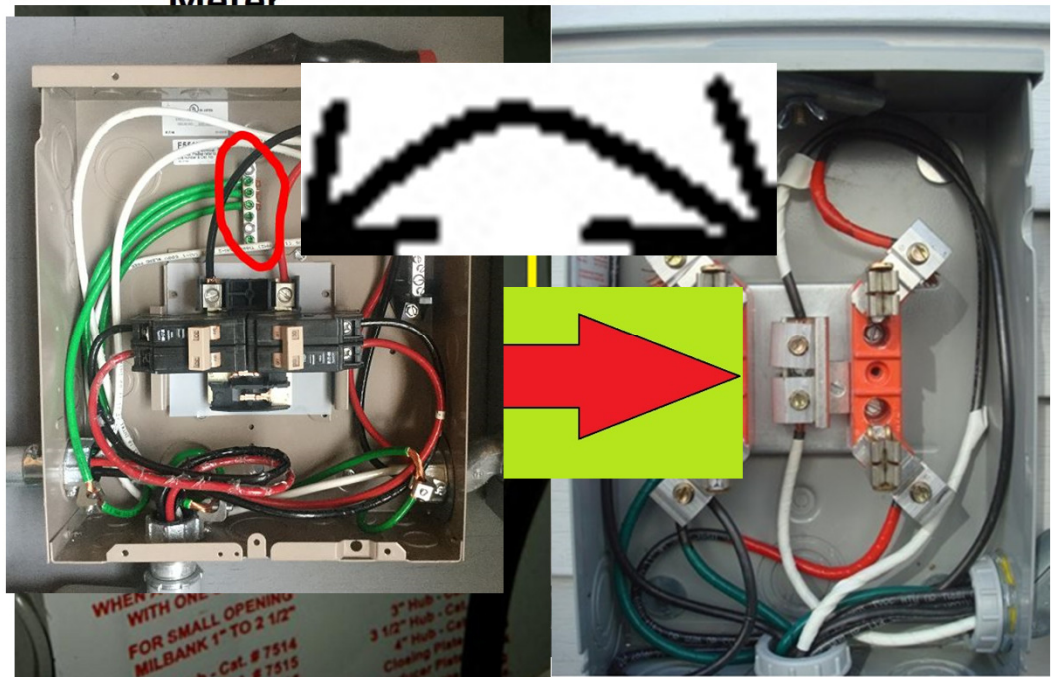
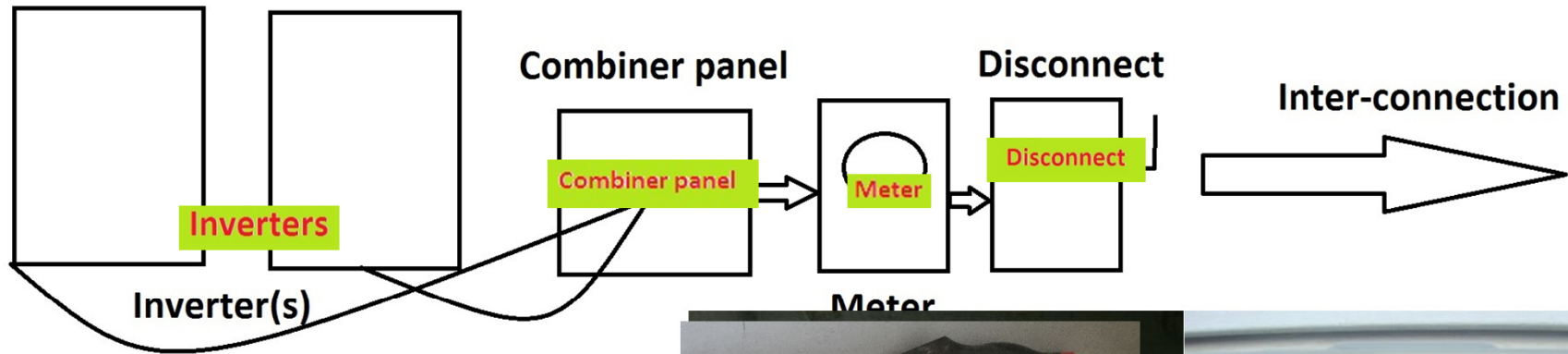
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The ole Bait and Switch Gear



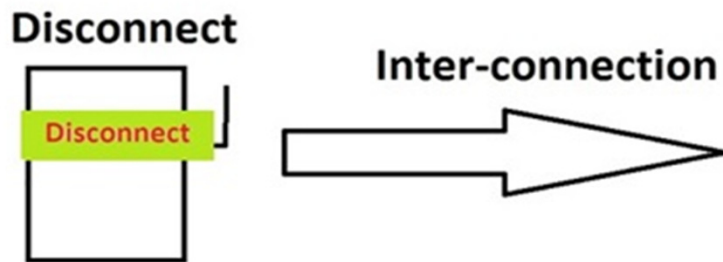


Switchgear





Switchgear cont.



SUPPLY SIDE
 NEC Article 705.12(A)

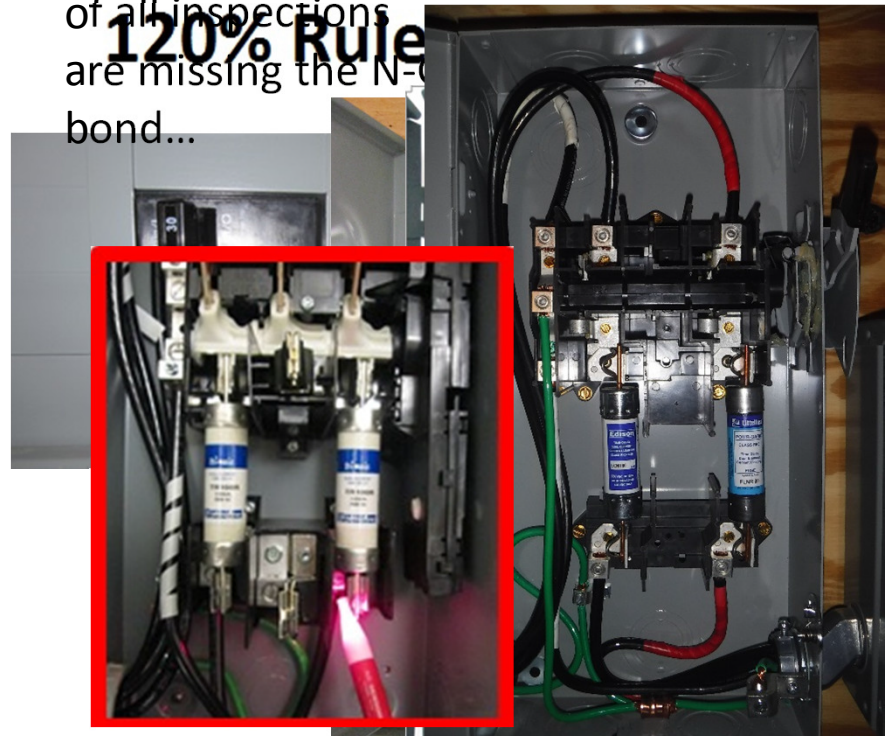
Approximately **16%**
 of all inspections
 are missing the N-G
 bond...

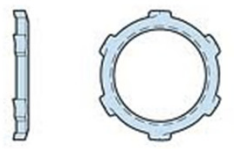
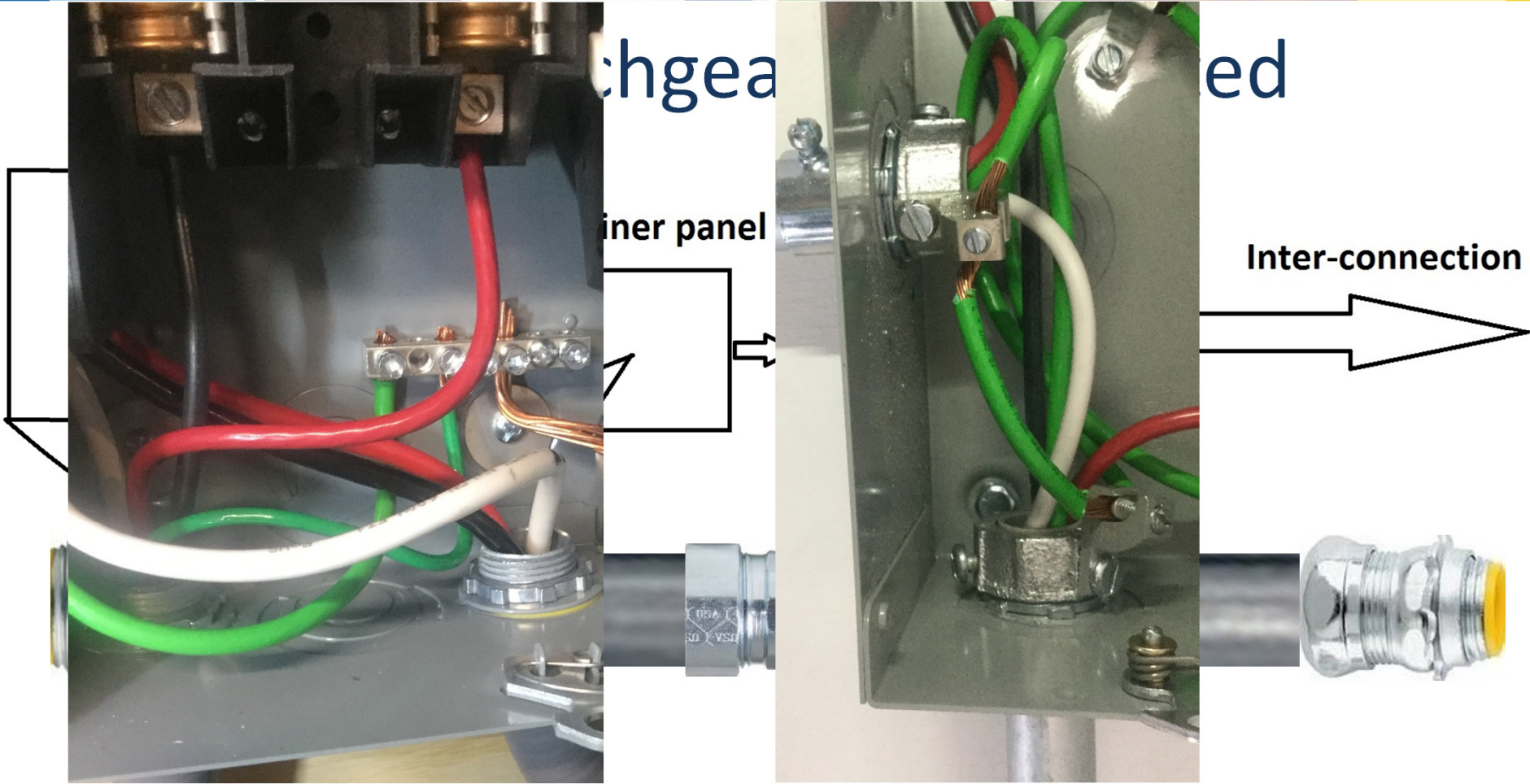
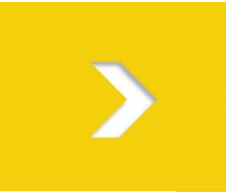
120% Rule

- Interconnection on utility side of main service disconnect

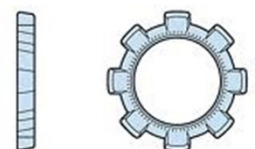
Key sections include:

- Typically on customer side of utility meter at dedicated OCPD
- "Second set" of service entrance conductors (Article 230)
- Utility conductors to be on line terminals of disconnect
 - These remain energized when disconnect is opened (turned off)





Stamped Steel Nut



Zinc Die-cast Nut



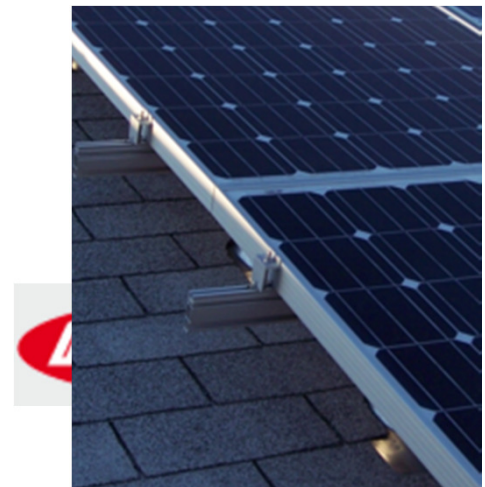


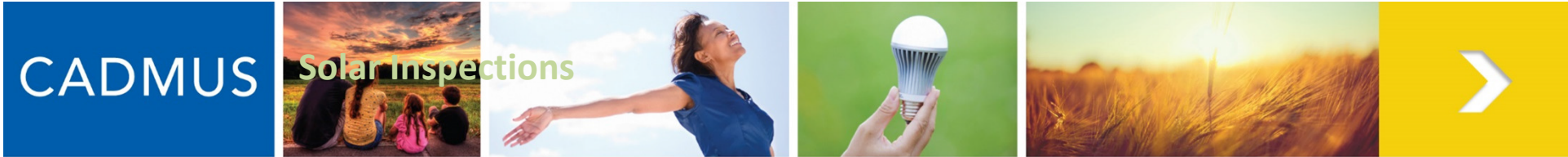
Collaboration, not competition



Staying current with code and its application

- Manufacture's instruction & installation manuals 110.3





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- Professional journals and publications





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- Professional journals and publications
- Online discussion groups and forums



ECN Electrical Forum

Discussion Forums for Electricians, Inspectors and Related Professionals



American Solar Energy Society

Leading the Renewable Energy Revolution

Collaboration, not competition



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- Professional journals and publications
- Online discussion groups and forums
- Professional organizations and conferences
- Discussion among colleagues



THANK YOU

